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Implicit Causality Biases Influence Relative Clause Attachment

Hannah Rohde, Roger Levy, & Andrew Kehler

Abstract

Problem: As comprehenders combine words to form a sentence, they must also combine clauses and sentences to form a coherent discourse. Is the resolution of local syntactic ambiguity sensitive to the process of inferring a coherent discourse?

Proposal: Bring together 3 observations about the pragmatic functions of relative clauses (RCs) and the biases associated with implicit causality (IC) verbs, and test whether these types of factors influence the resolution of local structural ambiguity in relative clause attachment:

(i) John detests/babysits the children of the musician who...

Results: An off-line sentence-completion study and an on-line self-paced reading study examined comprehenders' expectations for high/low RC attachments following IC and non-IC verbs. In both studies, IC verbs shifted readers' attachment preferences from low to high. In the completion study, most high-attaching RCs following IC verbs encoded explanations of the matrix-clause event. These results suggest that comprehenders use pragmatic cues mid-sentence to generate expectations about the structural analysis of the rest of the sentence.

1. Questions

- Do comprehenders bring expectations from the discourse level to bear on the resolution of syntactic ambiguity?
- Do these expectations impact online processing?

2. Phenomenon

Relative Clause Attachment Ambiguity

Previous work suggests low attachment in English is preferred (Cuetos & Mitchell 1988; Frazier & Clifton 1996; Carreiras & Clifton 1999; Fernandez, 2003; but see also Traxler, Pickering, & Clifton, 1998)

(1) Someone shot ^{HIGH}the servant of ^{LOW}the actress who was on the balcony.

- Primarily analyzed in terms of syntactically-driven biases
- Some previous work on discourse-driven biases
 - Discourse context is referential context
 - RC pragmatic function is to modify or restrict identity of referent
 - RC attaches to host with more than one referent (Desmet et al. 2002, Zagar et al. 1997, Papadopoulou & Clahsen 2006)

(2) There was a servant who was working for **two actresses**.
Someone shot the servant of the actress who was on the balcony.

(3) There were **two servants** working for a famous actress.
Someone shot the servant of the actress who was on the balcony.

3. Constructing Examples to Test Discourse Biases

- Observation #1: RCs can also provide an explanation

(4) The boss fired the employee who always showed up late.

→ (Cancelable) implicature that the employee's lateness is the reason for the boss' firing

- Observation #2: Bias towards explanations following IC verbs

→ In story continuations, IC verbs yield more explanations than NonIC verbs (Kehler, Kertz, Rohde, Elman 2008)

(5) IC: John detests Mary. She is arrogant and rude.

(6) NonIC: John babysits Mary. Mary's mother is grateful.

- Observation #3: w/explanation, IC verbs have next-mention bias

→ In sentence completions, IC verbs like *detest* yield more object next mentions (Caramazza, Grober, Garvey, Yates 1974; Brown & Fish 1983; Au 1986; McKoon, Greene, Ratcliff 1993; *inter alia*)

(7) IC: John detests ^{OBJ}Mary because she is arrogant.

(8) NonIC: John babysits Mary because he/she/they ...

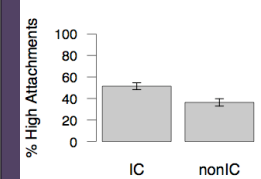
4. Predictions for IC Biases in RC Attachment

- (9) Non-IC: John babysits the children of the musician who...
 easier → (a) is a singer at the club downtown. (low)
 harder → (b) are students at a private school. (high)
- (10) IC: John detests the children of the musician who...
 harder → (a) is a singer at the club downtown. (low)
 easier → (b) are arrogant and rude. (high)

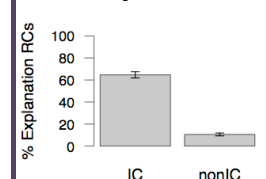
- Discourse Hypothesis: IC verbs will increase comprehenders' expectations for a high-attaching RC
- Null Hypothesis: Verb type will have no effect on attachment

6. Off-line Sentence Completion Results

More high-attaching RCs following IC verbs than NonIC



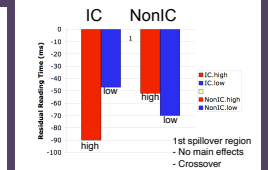
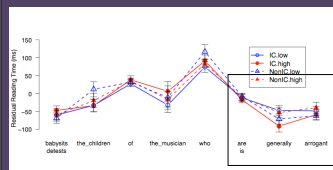
More explanation-providing RCs following IC than Non-IC



IC: John detests the children of the musician who ...
 NonIC: John babysits the children of the musician who ...

7. On-line Self-Paced Reading Results

- Online results match offline results: bias to high attachments following IC verbs
- As predicted, high-attaching RCs were read faster than low-attaching RCs in IC condition, while reverse was true in NonIC condition :: Crossover interaction
- Effects persist in comprehension-question accuracy: Crossover interaction (by subj)
 Low-attaching RCs in IC condition yielded worst accuracy



IC.low: detests the children of the musician who is generally arrogant...
 IC.high: detests the children of the musician who are generally arrogant...

NonIC.low: babysits the children of the musician who is generally arrogant...
 NonIC.high: babysits the children of the musician who are generally arrogant...

8. Conclusions

- Do people use discourse-level expectations and biases as they resolve local syntactic ambiguity?
 - YES, in RC processing
 - Where else might comprehenders be using discourse-level expectations?
- Processing models need to incorporate these types of discourse-level biases

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